EFFECT OF CORM SIZE AND POTASSIUM ON THE GROWTH, FLOWERING AND YIELD OF GLADIOLUS

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DECEMBER 2006

EFFECT OF CORM SIZE AND POTASSIUM ON THE GROWTH, FLOWERING AND YIELD OF GLADIOLUS

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A Thesis

Submitted to the Department of Horticulture & Postharvest Technology
Sher-e-Bangla Agricultural University, Dhaka
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE
IN
HORTICULTURE
SEMESTER: JULY-DECEMBER, 2006

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CERTIFICATE

This is to certify that thesis entitled, **"Effect of corm size and potassium on the growth, flowering and yield of Gladiolus"** submitted to the Department of Horticulture & Postharvest Technology, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE** in **HORTICULTURE**, embodies the result of a piece of bona fide research work carried out by **Farjana Ali, Registration No. 26252/00539** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

I further certify that such help or source of information, as has been availed of during the course of this investigation has duly been acknowledged.

Dated
Dhaka, Bangladesh.

Prof. Md. Ruhul Amin
Department of Horticulture and Postharvest Technology
SAU, Dhaka.

Dedicated to
My
Beloved Parents

ACKNOWLEDGEMENT

All praises are due to the Almighty "Allah" Who kindly enabled the author to complete the research work and the thesis leading to Master of Science.

The author feels proud to express her profound respect, deepest sense of gratitude, heartful appreciation to prof. Md. Ruhul Amin, Chairman, Department of Horticulture and Postharvest Technology, Sher-e-Bangla Agricultural University, Dhaka for his constant inspiration, scholastic guidance and invaluable suggestions during the conduct of the research and for his constructive criticism and whole hearted cooperation during preparation of this thesis.

The author express her heartfelt gratitude and indebtness to Associate professor Dr. Md. Nazrul Islam, Department of Horticulture and Postharvest Technology, Sher-e-Bangla Agricultural University, Dhaka for his assistance in planning and execution of the study and for his constructive instruction, critical reviews and heartiest cooperation during preparation of the manuscript.

The author also express her heartfelt thanks to all the teachers of the Dept. of Horticulture and Postharvest Technology, Sher-e-Bangla Agricultural University, Dhaka for their help, valuable suggestions and encouragement during the period of study.

The author is grateful to Md. Ashrafur Rrahman, Zuairia Sultana, Shafiqul Hoq Akand for their help, encouragement and moral support towards the completion of the degree.

Lastly, the author would like to acknowledge her heartiest gratitude to her parents and sister whose blessings, inspiration and encouragement opened the gate and paved the way to her higher studies.

The Author

EFFECT OF CORM SIZE AND POTASSIUM ON THE GROWTH, FLOWERING AND YIELD OF GLADIOLUS

ABSTRACT

The experiment was conducted in the Horticulture Farm of Sher-e-Bangla Agricultural University, Dhaka, Bangladesh during the period from November 2005 to June 2006. The experiment considered with two factors: Factor A: Corm size (3 sizes) i.e. small (11-20g), medium (21-30g) and large (31-40g); Factor B: Potassium fertilizer (6 levels) i.e. 0 kg/ha, 150 kg/ha, 170 kg/ha, 190 kg/ha, 210 kg/ha and 230 kg/ha. The experiment was laid out in Randomized Complete Block Design with three replications. Data were collected in respect of growth characters and yield of corm, cormel and spike of gladiolus. Minimum days (9.43) required for emergence of plant was recorded in large size corm and maximum days (12.17) required for emergence of plant was recorded in small size corm. Minimum days (64.94) required for emergence of spike was recorded in large size corm and maximum days (71.28) required for emergence of spike was recorded in small size corm. The tallest gladiolus plant (89.75 cm) at 75 days after planting (DAP) was recorded in large size corm. The highest weight of single corm (43.49 g) was recorded in large size corm. The highest number of cormel/plant (26.18) was recorded in large size corm and the lowest number of cormel/plant (21.97) was recorded for small size corm. The highest percentage of flowering plant (92.17) was recorded in large size corm and the lowest percentage of flowering plant (87.17) was recorded for small size corm. The highest yield of corm (14.37 t/ha) and cormel (12.27 t/ha) was recorded in large size corm and the lowest yield of corm (11.53 t/ha) and cormel (9.53 t/ha) was recorded for small size corm. In potassium fertilizer the minimum days (9.41) required for emergence of gladiolus plant was recorded in potassium fertilizer of 210 kg/ha. The maximum days (10.48) required for emergence of gladiolus plant was recorded with no potassium fertilizer. Minimum days (66.12) required for emergence of spike was recorded with 230 kg/ha and maximum days (70.32) required for emergence of spike was recorded with no potassium fertilizer. The highest gladiolus plant (90.45cm) at 75 DAP was recorded with 230 kg/ha. The highest yield of corm (14.74 t/ha) and cormel (12.23 t/ha) was recorded with 230 kg/ha and the lowest yield of corm (10.90 t/ha) and cormel (9.71 t/ha) was recorded with no potassium fertilizer. There were no interaction effects between corm size and levels of potassium fertilizer in terms of all the recorded character under the present investigation. Highest gross return was obtained from the treatment combination of large size corm and potassium fertilizer at 230 kg/ha and the highest benefit cost ratio was (3.90) attained from the treatment combination of large size corm and potassium fertilizer at 230 kg/ha.

LIST OF CONTENTS

LIST OF CONTENTS (Contd.)

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF APPENDICES

ABBREVIATIONS AND ACRONYMS

AEZ	Agro Ecological Zone
BARI	Bangladesh Agricultural Research Institute
CV	Cultivar
°C	Degree Celsius
cm	Centimeter
DAP	Days After Planting
ed	Edited
Ed.	Edited
ED.	Edition
et al.	And others
g	Gram
Kg	Kilogram
LSD	Least Significant Difference
m	Meter
mg	Milligram
N	Nitrogen
NS	Non Significant
P^H	Hydrogen Ion Concentration
ppm	Parts Per million
RCBD	Randomized Complete Block Design
RH	Relative Humidity
SAU	Sher-e-Bangla Agricultural University
t	Ton
t/ha	Ton per hectare
TSP	Triple Super Phosphate
Viz.	Namely
Var.	Variety
SRDI	Soil Resources Development Institute
ANOVA	Analysis of variance

Chapter I
Introduction

CHAPTER I

INTRODUCTION

Gladiolus is one of the most important cut flower in Bangladesh. Gladiolus belongs to the family Iridaceae and is harbaceous annual flower. Gladiolus seems to be originated in South Africa and the development of gladiolus started only at the beginning of the 18^{th} century. Gladiolus is a very popular flowering plant and occupying fourth place in international cut flower trade (Bose and Yadav, 1989). It has gained popularity in many parts of the world owing to its unsurpassed beauty and economic value (Chadha and Choudhuary, 1986).

The aesthetic value of gladiolus in the daily life is increasing with the advancement of civilization for the spikes owing to its elegance and long vase life. Gladiolus is frequently used as cut flower in different social and religious ceremonies. It is also used as bedding flower, herbaceous borders or does quite well in pots (Bose and Yadav, 1989). Gladiolus spikes are most popular in flower arrangement and preparing high class bouquets (Mukhopadhyay, 1995).

There is an increasing demand for its attractive spikes having florets of huge forms, dazzling colours, varying sizes and long vase life. It has recently become popular in Bangladesh and its demand in the country is increasing day by day. But its commercial production is still at the initial stage in this country due to lack of information regarding its cultivation technology and other factors, such as size of corm and cormel, depth of planting, application of fertilizer, planting time and fertilizer management which influence the production and quality of gladiolus flower as well as its corm and cormels (Khanna and Gill, 1983). Among these, size of corm and judicious application of potassium are very essential. Size of corm influences the production of Gladiolus. Large corms (4.6-5.0 cm in diameter) produced more flowers, corm and cormel than others (Mukhopadhyay and Yadav, 1984).

Gladiolus requires about 3 to 4 percent potassium in the leaves on a dry weight basis for the best yield and quality. Potassium deficiency results in shortening of spike length, reduction in the number of florets, general yellowing of older leaves and yellowing between the veins of younger leaves (Woltz, 1973).

There is a scope of increasing flower yield, quality of flower, corm and cormel production of gladiolus by using appropriate size of corm and potassium fertilizer. An optimum dose of application of nutrient elements will not only ensures better yield and quality of gladiolus but also led to minimum wastage of the nutrients.

In Bangladesh, gladiolus was introduced from India. It has great potential for local as well as export market. Commercial cultivation of gladiolus is gaining popularity due to export potential. The production is mainly concentrated only in few regions such as Jessore, Jenaidah, Rajshahi and Dhaka.

Limited research works has been done on nutrient requirements of gladiolus under the soil and climatic conditions of Bangladesh. Information regarding effect of corm size and potassium fertilizer on growth, flowering, corm and cormel production of gladiolus is scanty in the country.

Considering the above facts, the present investigation was undertaken with the following objectives –

1. To study the growth, flowering and yield performance of gladiolus under different size of corm.

2. To find out the optimum doses of potassium fertilizer for maximizing production of gladiolus flower, corm and cormel.

Chapter II

Review of literature

CHAPTER II

REVIEW OF LITERATURE

Many research works have been conducted on various aspects of gladiolus in different parts of the world. But limited research works has been carried out on gladiolus in Bangladesh. A review of literature related to effects of corm size and different level of potassium fertilizers on growth, flower, corm and cormel production of gladiolus is given below under the following headings.

2.1 Effect of corm size

Generally, corm and cormels are used as planting materials for propagating gladiolus. Size of corm used at planting has direct effects on cormels, corms and flower production of gladiolus.

Paswan *et al.*(2001) conducted a field trial in 1987-88, in Assam, India, to study the effect of corm size and corm pieces on corm and cormel production of gladiolus cv. Sylvia. Corms were graded into Large-Jumbo (> 5.1 cm), Medium No. 2 (3.2 to < 3.8 cm) and Small No. 3 (1.9 to < 2.5 cm) based on their diameters. Corms of large and medium grades were divided into two and three pieces, except the small grade corm, which was divided into two. Large and medium sized whole corms produced more number of leaves with maximum length and breadth compared to small grade corms and all other pieced corm treatments. Among all treatments, whole corm of large and medium sizes produced the largest corms in terms of diameter and weight. Flowering grade corms were also produced by whole corms as well as corm pieces of all sizes. Although there was an apparent decrease in number of cormels per piece of corm with the increase fractionation compared to whole corms of all size grades, there was actually a substantial increase in number of cormels within the same size grade of corms.

Singh *et al.* (2000) Gladiolus cv. Pink Friendship corms of 6 different size grades (from > 1.9-_2.5 cm to > 6.0-_6.5 cm) were planted in the field at a spacing of 30 x 20 cm in a trial conducted over 3 years (1995-97) at Bangalore, India. Large corms took longer to sprout but flowered earlier; plants were taller with larger leaves and flower spikes, had more florets per spike and produced more cormels/plant, compared with medium or small corms.

Singh and Singh (1998) conducted an experiment to investigate the effect of corm size on flowering and corm production of gladiolus cv. Sylavia in Himachal Prodesh, India. The three corm sizes used were large, medium and small. It was found that percentage of sprouting was highest in large corms (99.73%) compared to 81.90 and 67.60% in medium and small corms, respectively. Large corms were also superior in terms of number of spikes, number of shoots per corm, time of sprouting, plant height, spke length, nuber of flowers per spike (15.53, 15.51 and 9.52 for large, medium and small, respectively) and diameter of corm produced (5.98, 3.98 and 3.67 cm for large, medium and small, respectively).

Kalasareddi *et al.* (1997) conducted an experiment to study the effect of different corm size (very small, small, medium and large) on flowering of gladiolus cv. Snow White and found that corm size was significantly influenced the time taken for spike emergence, time taken for flowering, time taken for complete flowering, spike length, spike girth, number of flowers per spike and number of spikes per hectare. Large corms flowered earlier than smaller corms and produced better quality spikes. The highest yield of spikes (37333/ha in number) was obtained form large corms.

Singh (1996) studied the effect of cormel size and levels of nitrogen on corm production of gladiolus cv. Pink Friendship in India. The different cormel size were 1.30 -1.90, or 1.91-2.50 cm in diameter and the rates of nitrogen were 100, 150, 200, 250, 300 or 350 kg per hectare. It was found that large cormels produced large cormels produced large corms with the highest number of cormels per plant. The best treatments for producing large corms with maximum number of cormels were the planting of large cormels fertilized with N at 200 or 250 kg per hectare.

Azad (1996) carried out an experiment to investigate the effect of corm size and plant spacing on growth and flower production of gladiolus. Corms of three sizes (6.5, 16.0 or 30.0 g) were planted at the spacings of 20 x 10, 20 x 15 or 20 x 20 cm. The highest yield of mother corms (13.17 t/ha) and cormels (22.36 t/lha) were recorded form the treatment combination of close spacing (20 x 10 cm) and large corm (30.0 g).

Patil *et al.*(1995) conducted an experiment to investigate the effect of different spacing and corm size on the flower and corm production of gladiolus. Corms of 3 sizes (>4.1, 3.1-4.0 and 2.1-30 cm) were planted at the spacing of 30 x 20 or 30 x 30 cm. Corm size and spacing had no significant effects on spike length, floret size, number of florets per spike or the size of corms produced.

Ogale *et al.* (1995) reported the role of corm size on gladiolus flowering and corm yield of gladiolus. Young gladiolus cormels required 2-3 seasons of vegetative growth before flowering can be induced. They have observed that there was a direct correlation between corm size, flower production and final corm yield.

Mollah *et al.* (1995) carried out an experiment to investigate the effect of cormel size and plant spacing on growth and yield of flower and corm of gladiolus at Pahartali, Bangladesh. It was found that cormel of 7.0 $\pm$ 0.20 g in size with widest plant spacing (15 x 15 cm) production the longest rachis (43.5 cm), maximum number of floret per rachis (11.9), heavier corm (31.33) and highest number of cormels (21.87) per plant.

Laskar and Jana (1994) investigated the effect of planting time and size of corms on plant growth, flowering and corm production of gladiolus. Corm and flower production were best with planting on 19 March (1.86-1 1.95) corms and 1.58-1.63 flower spikes per plant) using the largest corms (1.72-1.78 corms per plant and 1.57-1.57-162 flower spikes).

Mohanty *et al.* (1994) studied the effect of corm size and pre-planting chemical treatment of corm on growth and flowering of gladiolus cv. Vink`s Beauty. They planted the corm of different sixes viz. large (2.45-2.55 cm in diameter), medium (1.25-1.30 cm) and small (0.85-0.90 cm) with soaking in solutions containing GA_3 at 50, 100 or 150 ppm and etherl at 100, 250 or 500 ppm or in distilled water for 24 hours. It was reported that taller and thicker plants with more leaves were obtained from the large corm than those from medium or small corms.

Ko *et al.* (1994) studied the effect of Planting time and corm size on the duration of flower and corm production of gladiolus in Korea. Corms of different sizes (6-8, 8-10 or 10-12 cm) were planted on 19 May, 17 June and 15 July of 1992. It was found that earlier planting with larger corms (10-12 cm in diameter) produced longer cut stems and spikes and higher, cut flower weight, maximum number of floret (14.3), floret length and diameter and hgiher percentage of best quality flowers.

In another experiment, Vinceljak (1990) studied the effect of corm size on corm yield of gladiolus cv. Oscar and Peter Pears. In general, shoots from larger corms started to emerge earlier than those from smaller corms. The effect of corm size on production of new corm number/m^2 differed in the two experimental years, in one year the use of smaller corms increased corm number/m^2 and in the next year it decreased. The yield of small cormels (> 4 cm) and total corm yield (4-14 cm) were similar for the two cultivars. Oscar produced about 14 per cent higher yield of corms suitable for cut flower production (8-14 cm) than Peter Pears.

In an experiment, Arora and Khanna (1990) studied the effect of cormel size on corm production of gladiolus in India. It was found that corm weight in the first and second year was higher when larger cormels (2.25± 0.25 cm in diameter) were planted.

Hong *et al.*(1989) studied the effect of leaf remaining after cutting the flower, corm lifting date and corm size on corm production and flowering in the next crop of gladiolus at Suwon, Korea. They observed that diameter of corm and weight of corm, number and weight of cormels increased with increasing the number of leaves after cutting the flowers. They also reported that the number of daughter corms and flowering ability increased with increasing corm size up to 4-5 cm diameter.

Dod *et al.* (1989) investigated the effects of different dates of planting and corm size on growth and flower yield of gladiolus in India. They reported that the best results could be obtained from the large corms (>3.0 cm in diameter) with the earliest date of planting.

In another experiment, Gowda (1988) studied the effect of corm size (viz. 3-4 cm, 4.1-4.5 cm and 4.5-5.0 cm) on growth and flowering of gladiolus cv. Picardy under Bangalore conditions, India. The best result in respect of growth and flowering was found when larger corms were used as planting materials.

Gowda (1987) reported that there was an interaction effect of corm size and spacing on growth and flower production in gladiolus cv. Snow Prince. Corms of 3-4, 4.1-4.5 and 4.6-5.0 cm in diameter were planted at 30 x 10, 15, 20 or 25 cm and the effects on days to sprouting, plant height, number of leaves, number of plantlets produced and number of flower spikes per plant were assessed. The best result was obtained by planting 4.1-4.5 cm corms.

Syamal *et al.* (1987) studied the effect of corm size, planting distance and depth of planting on growth and flowering of gladiolus cv. Happy End. They observed that large corms (4-5 and 5-6 cm in diameter) gave earlier sprouting, and deeper planting at 6 cm resulted in delayed sprouting. It was also found that increased corm size gave a significant increase in inflorescence and stem length.

Sciortino *et al.* (1986) studied the effect of size of propagating materials and plant density on the yield of corms for forced flower production in gladiolus cv. Peter Pear. They obtained higher yield with increasing cormel size (1-4 cm in circumference).

Misra *et al.* (1985) condcuted an experiment to investigate the effects of different sizes of planting materials on flowering of gladiolus var. "White Oak" in India. They observed that the commercial grade spikes were obtained from corms ofgrade no. 6 (1.9-2.5 cm in diameter) but acceptable quality spikes were obtained fromgrades of corms in the range of 1.3-1.9 to 0.8-1.0 cm in diameter.

Mukhopadhyay and Yadav (1984) conducted an experiment to study the effect of corm size and spacing on growth, flowering and corm production in gladiolus. They planted corms ranging in the sizes from 3.5 to 5.0 cm in diameter at 10 x 30, 15 x 30, 20 x 30 and 25 x 30 cm. It was found that large sized corms (4.5-5.0cm) produced more flowers and corms and cormels than the other sizes.

Mckay *et al.* (1981) studied the effect of corm size and division of the mother corm in gladiolus. They used four sizes of gladiolus corms. Those were > 50 mm, 38-50 mm, 33-38 mm and 25-33, 19-25 mm and 13-19 mm and were planted whole or after being cut in half. Plants from whole, large corms produced the highest inflorescence yield with better quality. For the large corms, cutting increased the yield of new corms by 93 per cent.

Bhattacharjee (1981) observed that flower and corm production of gladiolus were influenced by corm size, planting depth and spacing. Corms of three sizes viz. 2.5-3.5, 4-5 and 5.5-6.5 cm in diameter of gladiolus cv. Friendship were planted at 3 depths viz. 5, 7 and 9 cm and 3 spacings viz. 15, 20 and 25 cm within the rows. Increasing of corm size increased the spike length, floret number, flower diameter and the size and weight of corms. Increasing in planting depth improved the quality of flower spikes as well as lifted corms.

Bankar and Mukhopadhyay (1980) carried out an experiment to investigate the effects of corm size, depth of planting and spacing on the production of flowers and corms in gladioulus. The experiment was consisted of three corm sizes viz. 1.5-2.5, 2.5-3.5, 3.5-4.5 g; three depth of plating viz. 3, 5 or 7 cm and three spacings viz. 15, 20 or 25 cm. It was observed that large corms increased the height of plant (58.61 cm) highly significantly and length of spiks (101.12cm).

Corm size influenced the quality of flower in gladiolus. Gill *et al.* (1978) in their experiment studied the effect of corm size on the quality of gladiolus flower. Corm of six sizes viz. >2, 2-10, 10-20, 20-30, 30-40 or> 40 g were used in this experiment. They observed a positive correlation between corm size and plant height, number of leaves per plant and length of flower stalk.

Kosugi and Kondo (1959) reported that the corm and conrmel production depended on the size of the corms, because larger corms, contained more food material. Similar conclusion has been drawn by El-Gammasay abd El-Gendy (1962), who stated that the size of corms determined the corm and cormel production due to more stored food materials in the larger corms.

2.2 Effect of potassium fertilizer

Das *et al.* (1998) in a field experiment in 1994-96 in New Delhi, the effect of spike removal and K application corm yield in 10 gladiolus cultivars was examined. The corms weight/plant was higher with 200 kg K_2O/ha rather than 100 kg K_2O, but corms/plant was not affected by the K rate.

Singh *et al.* (1976) reported that flower yield of tuberose depends upon the dose of nitrogen, phosphorus and potash. They recommended a dose of 80 kg nitrogen, 60 kg phosphorus and 40 kg potash per hectare, respectively under Uttar Pradesh. India conditions to have a optimum flower yield. According to them potash increased the yield of fresh flowers through increasing the number of spike. Number and weight of flower per hill and also the weight of flowers per spike.

Woltz (1973) reported that gladiolus required about 3 to 4 per cent potassium in the leaves on a dry weight basis for the best yield and quality of flowers. Potassium deficiency results in shortening of spike length, reduction in the number of florets, general yellowing of elder leaves and yellowing between the veins of younger leaves. In case of severe deficiency the older leaves show marginal leaf burn.

Skalska (1970) also reported that significant increase in weight of corms and cormels of gladiolus when split application of K was applied. Pandey and Jaukari (1970) reported that the application of 90 kg K resulted in the highest yield of corm and improved its quality.

Trials in North Carolina on a sandy loam soil showed increase in corm yields and length of spikes of gladiolus following side dressings of potassium but no response of N. Mn or Fe fertilizers was recorded. Application of 55 kg available K/ha was recommended when the plants began to send up flower spikes (Jenkins, 1961).

Higher levels of potassium were effective to production greater number of flowers and large flower size in gladiolus (Lemeni and Lemeni, 1965). Kosugi and Kondo (1961) reported improvement in flowering of gladiolus by using high dose of potassium.

El-Gamassy (1958) conducted an experiment to study the relative effect of various fertilizer elements on growth, flowering, corm and cormels production of gladiolus. It found that application of potassium before flowering resulted better yield of best quality flowers and corms.

Chapter III

Materials and Methods

CHAPTER III

MATERIALS AND METHODS

The present investigation was carried out at the Horticulture Farm of Sher-e-Bangla Agricultural University, Dhaka, during the period from November 2005 to June 2006.

3.1 Climate

The experimental area is under the subtropical climate, which is characterized by heavy precipitation during the month of April to September, and scanty precipitation during the period from October to March. The detailed meteorological data in respect of air, temperature, relative humidity, rainfall and sunshine hour recorded by the Dhaka Meteorological Centre, Dhaka for the period of experimentation have been presented in Appendix I .

3.2 Soil

The soil of the experimental area belongs to the Madhupur tracts. The analytical data of the soil sample collected from the experimental area determined in the SRDI, Soil Testing Laboratory, Khamarbari, Dhaka has been presented in Appendix II.

The experimental site was a medium high land and P^H of the soil was 5.6.The Morphological characters of the soil of the experimental plots are given below-

AEZ No.	-	28
Soil series	-	Tejgaon
General soil	-	Shallow red brown terrace soil

3.3 Treatment of the experiment

The experiment was set up to investigate the effect of corm size and different doses of potassium fertilizer on the growth, flowering, corm and cormel production of Gladiolus.

The study consisted of two factors, which are given below-

Factor A		:	Corm Size
i)	C_1	:	Small (11-20g)
ii)	C_2	:	Medium (21-30g)
iii)	C_3	:	Large (31-40g)

Factor B		:	Potassium fertilizer
i)	F_0	:	Control
ii)	F_1	:	150 kg/ha
iii)	F_2	:	170 kg/ha
iv)	F_3	:	190 kg/ha
v)	F_4	:	210 kg/ha
vi)	F_5	:	230 kg/ ha

3.4 Planting materials

The corms of gladiolus were collected from Ananda Nursery, Savar Bazar, Dhaka.

3.5 Land Preparation

The experimental plot was first opened by a power tiller. Land was then ploughed and cross ploughed several times by a power tiller. The clods were broken and weeds were collected before final land preparation. Manure and TSP were applied as basal dose but urea and MP were applied in two installments.

3.6 Experimental design and layout

The two factor experiment was laid out in Randomized Complete Block Design (RCBD) with 3 replications. The whole experimental area was 23 m × 5.45 m which was divided into 3 blocks. Each block was divided in 18 plots, where 18 treatments were assigned at random. Thus, there were 54 (18x 3) unit plots in the experiment. The size of unit plot was 0.75 m x 0.75m. The distance between block to block was 0.8 m and between plot to plot was 0.5 m. The plots were raised upto 15 cm . The complete layout of the experiment has been shown in Figure 1.

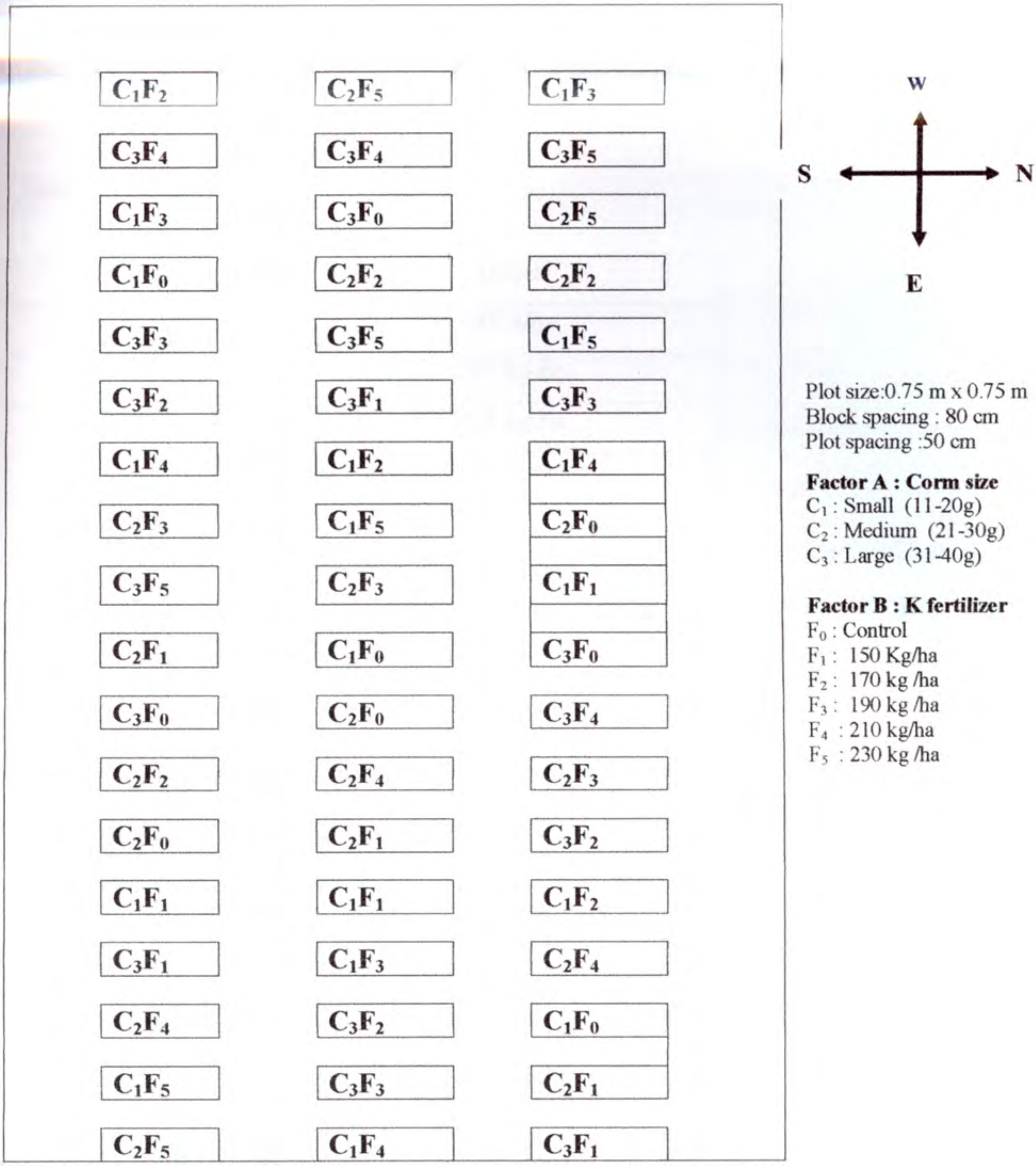


Fig 1 : Field layout of the two factors experiment in the Randomized Complete Block (RCB) experimental design.

3.7 Manure and fertilizer

The crop was fertilized with the following doses of manure and fertilizers as recommended by BARI (Anon., 2002).

Table 1. Doses of manure and fertilizers

Manure/ fertilizers	Doses
Cowdung	100 t/ha
Urea	200 kg/ha
TSP	225 kg/ha
MP	As per treatment

Full amount of cowdung and TSP were applied during final land preparation. Urea and MP were applied in two installments at 25 and 50 days after planting of corms, here potassium was applied as per treatment schedule.

3.8 Planting of corms

The corms were planted in 7 cm depth in furrows on November 27, 2005. Spacing was maintained as 25 cm and 15 cm for line to line and corm to corm respectively.

3.9 Weeding and mulching

The field was weeded as and when necessary. The soil was mulched frequently after irrigation by breaking the crust for easy aeration and to conserve soil moisture.

3.10 Irrigation

The experimental plots were irrigated as and when necessary during the crop period.

3.11 Earthing up

Earthing up was done twice during growing period. The first earthing up was done at 25 days after planting (DAP). The second earthing up was done after 45 DAP.

3.12 Staking

Bamboo stick was placed for staking and spikes were tied with the stick.

3.13 Selection and tagging of plants

Ten plants from each of the plots were selected randomly and tagged for recording data on different characters.

3.14 Harvesting

The spikes of gladiolus were harvested when the basal florets showed colors. Harvesting was done during February 16 to March 2, 2006 and corm and cormel were harvested on June 20, 2006.

3.15 Collection of data

3.15.1 Days required for emergence of plant

It was achieved by recording the days taken for emergence of the plant from each plot.

3.15.2 Days required for emergence of spike.

It was achieved by recording the days taken for emergence of spike from each plot.

3.15.3 Average plant height

Plant height refers to the length of the plant from ground level upto shoot apex of the plant. It was measured at an interval of 15 days starting from 30 days after planing (DAP) till 75 DAP.

3.15.4 Average number of leaves

All the leaves of ten selected plants were count at an interval of 15 days starting from 30 DAP till 75 DAP.

3.15.5 Length of flower stalk

Length of flower stalk was measured from the base to the tip of the spike at harvest.

3.15.6 Length of rachis

Length of rachis refers to the length from the axil of first floret upto the tip of the inflorescence. The length of rachis was measured by a meter scale at harvest and recorded.

3.15.7 Number of spikelet per spike

All the spikelets of the spike were count from 10 randomly selected plants and their mean was calculated.

3.15.8 Weight of a single spike

Ten spikes were cut from randomly selected plants from each plot and the weight of spikes were recorded to calculate their mean.

3.15.9 Percentage of flowering plant

It was calculated by counting the numbers of plants bearing flowers in each plot divided by the number of plants emerged.

3.15.10 Diameter of individual corm

A slide calipers was used to measure the diameter of the corm.

3.15.11 Length of individual corm

Corms were separated from the plant and the length of corms was taken by a slide calipers.

3.15.12 Number of cormel per plant

It was calculated from the number of cormels obtained from ten randomly selected plants and mean was found.

3.15.13 Average weight of corm per plant

It was determined by weighing the corms from ten randomly selected plants and mean weight of a corm was calculated.

3.15.14 Yield of spike per hectare

The total weight of spike per unit plot was converted to yield of spike per hectare.

3.15.15 Yield of corm per hectare

It was calculated by converting the yield of corm per plot .

3.15.16 Yield of cormel per hectare

It was calculated by converting the yield of cormel per plot.

3.15.17 Number of spikes per hectare

Number of spikes per hectare was computed from numbers of spikes per plot.

3.16 Statistical analysis

The recorded data on different parameters were statistically analyzed using MSTAT software to find out the significance of variation resulting from the experimental treatments. The mean for the treatments was calculated and analysis of variance for each of the characters was performed by F (variance ratio) test. The differences between the treatment means were evaluated by LSD test at 1% or 5% level of probability. The analysis of variance (ANOVA) of the data on different characters of gladiolus are given in Appendix III-V.

3.17 Benefit Cost Ratio

The cost of production was analyzed in order to find out the most profitable treatment combination of corm size and potassium fertilizer. All the nonmaterial and material input costs and interests on fixed and running capital were considered for estimating the cost of production. The interests were calculated as 13% for one year.

Chapter IV

Results and Discussion

CHAPTER IV

RESULTS AND DISCUSSION

The present experiment was conducted to observe the effect of corm size and different levels of potassium fertilizer on growth, flowering, corm and cormel production of gladiolus. The analysis of variance (ANOVA) of the data on different yield components of gladiolus is given in Appendix III-V. The results have been presented and discussed and possible interpretations have been given under the following headings.

4.1 Plant height (cm)

Plant height (cm) was significantly influenced by corm size (Appendix III). Although, the different corm size showed a gradual increasing trend in height of gladiolus starting from small to large size at 30, 45, 60 and 75 DAP (Table 2). The tallest (89.75 cm) gladiolus plant at 75 DAP was recorded in large size corm which was closely followed by medium size corm (84.64 cm). The shortest (76.83 cm) gladiolus plant at 75 DAP was recorded for small size corm. The results indicated that large size corm produced the highest plant height with ensuring the nutrient elements adequately for newly emerged plants.

In considering the plant height at 30, 45, 60 and 75 DAP, different levels of potassium fertilizer showed a statistically significant dissimilarity (Appendix III). With the increases of potassium fertilizer plant height of gladiolus increased and represented an increasing trend (Table 2). The highest (90.45 cm) gladiolus plant at 75 DAP was recorded in potassium fertilizer at 230 kg/ha which was closely followed by 210 kg/ha (87.80 cm). On the other hand, the shortest (75.73 cm) gladiolus plant was recorded in the plot with no potassium fertilizer. Probably, potassium fertilizer helps to make available other nutrients elements of soil which also ensures the advanced growth of gladiolus plants.

Table 2. Main effect of corm size and potassium fertilizer on plant height and number of leaves at different days after planting (DAP)

Treatment	Plant height (cm) at				Number of leaves/plant at			
	30 DAP	45 DAP	60 DAP	75 DAP	30 DAP	45 DAP	60 DAP	75 DAP
Corm size								
Small	23.52	47.16	60.60	76.83	3.92	5.40	7.65	9.58
Medium	25.97	52.33	62.90	84.64	3.97	5.49	7.88	10.33
Large	27.98	55.59	66.68	89.75	4.37	6.14	8.20	10.42
$LSD_{(0.05)}$	0.521	0.325	0.784	0.475	0.124	0.257	0.145	0.652
Level of significance	**	**	**	**	**	**	**	**
Potassium fertilizer								
Control	22.34	44.81	55.74	75.73	3.68	5.25	7.38	9.41
150 kg/ha	24.47	47.59	59.2	80.04	4.00	5.41	7.56	9.97
170 kg/ha	25.37	50.48	62.24	82.93	4.08	5.43	7.71	10.10
190. kg/ha	26.27	53.48	65.05	85.48	4.13	5.54	8.04	10.25
210 kg/ha	27.62	55.56	67.49	87.80	4.16	6.10	8.21	10.43
230 kg/ha	28.88	58.25	70.61	90.45	4.49	6.34	8.58	10.48
$LSD_{(0.05)}$	1.258	4.512	3.126	3.852	0.152	0.425	0458	0.745
Level of significance	**	**	**	**	*	**	**	**

** Significant at 1% level of probability

Interaction effect between corm size and potassium fertilizer showed no significant differences in all the date recorded for plant height of gladiolus (Appendix III). But highest (97.25 cm) height of gladiolus at 75 DAP was recorded in large size corm with 230 kg/ha potassium fertilizer and the shortest (70.00 cm) in small size corm with no potassium fertilizer (Table 3).

4.2 Number of leaves

Statistically significant differences were recorded in terms of number of leaves with the effect of corm size of gladiolus (Appendix III). Although, the different corm size showed a gradual increasing trend of number of leaves/plant in gladiolus at 30, 45, 60 and 75 DAP for small to large sized corm (Table 2), the maximum (10.42) number of leaves/plant at 75 DAP was recorded in large size corm which was statistically similar with medium sized corm (10.33) but significantly differed with small sized corms (9.58).

Different levels of potassium fertilizer showed a statistically significant difference in considering the number of leaves/plant at 30, 45, 60 and 75 DAP (Appendix III). With the increases of potassium fertilizer number of leaves/plant of gladiolus increased and represented an increasing trend (Table 2). The maximum (10.48) number of leaves/plant at 75 DAP was recorded in potassium fertilizer at 230 kg/ha, which was statistically identical with other treatments except control and 150 kg/ha potassium. On the other hand, the minimum (9.41) number was recorded in the plot with no potassium fertilizer, which was statically similar with 150 kg/ha.

Interaction effect between corm size and different levels of potassium fertilizer showed no significant differences in all the data (Appendix III). But maximum (10.92) number of leaves/plant of gladiolus at 75 DAP was recorded in large size corm with potassium fertilizer at 230 kg/ha and the lowest (8.85) number of leaves/plant was recorded in small sized corm with no potassium fertilizer (Table 3).

Table 3. Interaction effect of corm size and potassium fertilizer on plant height and number of leaves at different days after planting (DAP)

Corm size × Potassium fertilizer		Plant height (cm)				Number of leaves/plant at			
		30 DAP	45 DAP	60 DAP	75 DAP	30 DAP	45 DAP	60 DAP	75 DAP
Small	Control	20.06	41.55	52.55	70.00	3.51	4.98	7.13	8.85
	150 kg/ha	22.30	43.20	55.20	73.55	3.83	5.14	7.30	9.41
	170 kg/ha	23.50	44.85	59.33	75.65	3.92	5.16	7.45	9.54
	190. kg/ha	24.25	48.55	62.85	78.25	3.96	5.27	7.79	9.69
	210 kg/ha	25.15	51.25	65.33	80.00	4.00	5.81	7.95	9.87
	230 kg/ha	25.85	53.55	68.33	83.55	4.32	6.05	8.30	10.14
Medium	Control	22.70	44.55	55.33	76.33	3.56	5.06	7.35	9.59
	150 kg/ha	24.55	48.00	59.20	81.25	3.88	5.22	7.53	10.15
	170 kg/ha	25.45	51.33	61.55	84.20	3.96	5.24	7.68	10.28
	190. kg/ha	26.55	54.55	64.30	86.85	4.01	5.35	8.01	10.43
	210 kg/ha	27.60	56.00	67.15	88.66	4.04	5.92	8.18	10.61
	230 kg/ha	28.95	59.55	69.85	90.55	4.37	6.14	8.53	10.89
Large	Control	24.25	48.33	59.35	80.85	3.96	5.71	7.66	9.80
	150 kg/ha	26.55	51.56	63.20	85.33	4.28	5.86	7.84	10.36
	170 kg/ha	27.15	55.25	65.85	88.95	4.37	5.89	7.99	10.49
	190. kg/ha	28.00	57.33	68.00	91.35	4.41	6.00	8.32	10.64
	210 kg/ha	30.10	59.42	70.00	94.75	4.45	6.56	8.50	10.82
	230 kg/ha	31.85	61.65	73.65	97.25	4.77	6.82	8.90	10.92
$LSD_{(0.05)}$		--	--	--	--	--	--	--	--
Level of significance		NS	NS	NS	NS	NS	NS	NS	NS
CV (%)		6.80	3.52	6.58	5.85	4.20	5.72	4.86	7.84

NS : Non Significant

4.3 Days required for emergence of plant

The effect of corm size on days required for emergence of plant was significantly influenced (Appendix IV). The minimum days (9.43) required for emergence of plant was recorded in large size corm (Table 4); whereas the maximum days (12.17) required for emergence was recorded for small size corm which was closely followed by medium size corm (11.26). Ogale *et al.* (1995) also reported that large corm had shorter dormancy which helps in quick emergence of gladiolus plant.

Different levels of potassium fertilizer showed no significant effect for days required for emergence of gladiolus plant (Appendix IV). But the range of the days required for all levels of potassium fertilizer varied from 10.77 to 11.37 days (Table 4). The minimum days (10.77) required for emergence of gladiolus plant was recorded in potassium fertilizer with 210 kg/ha and the maximum (11.37) was recorded in potassium fertilizer with 150 kg/ha.

Interaction effect between corm size and potassium fertilizer showed no significant differences for days required for emergence of gladiolus (Appendix IV). But minimum days (9.22) required for emergence of plant was recorded in large size corm with 170 kg/ha potassium fertilizer and the maximum (12.67) was recorded in small size corm with 150 kg/ha potassium fertilizer (Table 5).

Table 4. Main effect of corm size and potassium fertilizer on days required for emergence of plant and spike, length of flower stalk at harvest, length of rachis at harvest, number of spikelet per spike, weight of spikelet, diameter of individual corm of gladiolus

Treatment	Days required for emergence of plant	Days required for emergence of spike	Length of flower stalk at harvest (cm)	Length of rachis at harvest (cm)	Number of spikelet per spike	Weight of single spike (g)	Diameter of individual corm (cm)
Corm size							
Small	12.17	71.28	62.96	35.12	11.45	52.83	2.03
Medium	11.26	66.93	65.64	39.45	12.52	56.31	2.16
Large	9.43	64.94	70.57	41.12	13.23	59.28	2.27
$LSD_{(0.05)}$	1.125	1.147	1.956	1.282	0.428	1.751	0.125
Level of significance	**	*	**	**	**	**	**
Potassium fertilizer							
Control	10.93	70.32	61.18	36.82	11.00	52.47	2.00
150 kg/ha	11.37	68.33	63.98	36.87	11.42	53.82	2.09
170 kg/ha	10.85	68.00	65.72	37.93	12.07	55.40	2.14
190. kg/ha	10.89	67.00	67.40	39.07	12.80	57.17	2.19
210 kg/ha	10.77	66.53	68.87	39.48	13.22	58.37	2.23
230 kg/ha	10.89	66.12	71.20	41.22	13.90	59.62	2.27
$LSD_{(0.05)}$	--	0.784	2.766	1.812	0.606	2.476	0.177

* Significant at 5% level of probability
** Significant at 1% level of probability

Table 5. Interaction effect between corm size and potassium fertilizer on days required for emergence of plant and spike, length of flower stalk at harvest, length of rachis at harvest, number of spikelet per spike, weight of spikelet, diameter of individual corm of gladiolus

Corm size × Potassium fertilizer		Days required for emergence of plant	Days required for emergence of spike	Length of flower stalk at harvest (cm)	Length of rachis at harvest (cm)	Number of spikelet per spike	Weight of single spike (g)	Diameter of individual corm (cm)
Small	Control	12.44	74.67	58.85	33.00	10.00	50.55	1.95
	150 kg/ha	12.67	72.00	61.50	33.25	10.25	51.25	1.98
	170 kg/ha	12.22	72.00	62.90	33.90	11.10	52.10	2.03
	190. kg/ha	12.00	71.00	63.60	36.00	11.95	53.80	2.05
	210 kg/ha	11.67	70.00	64.20	36.55	12.40	54.35	2.06
	230 kg/ha	12.00	68.00	66.70	38.00	13.00	54.95	2.09
Medium	Control	10.89	70.30	60.85	38.20	11.15	52.75	2.00
	150 kg/ha	11.99	67.00	63.70	37.22	11.85	54.65	2.12
	170 kg/ha	10.78	66.00	64.95	38.60	12.25	56.25	2.15
	190. kg/ha	11.44	65.30	66.15	40.00	12.90	57.15	2.20
	210 kg/ha	11.11	65.00	68.20	40.10	13.15	58.05	2.22
	230 kg/ha	11.33	66.00	70.00	42.60	13.85	59.00	2.28
Large	Control	9.45	65.00	63.85	39.25	11.85	54.10	2.04
	150 kg/ha	9.45	65.00	66.75	40.15	12.15	55.55	2.18
	170 kg/ha	9.56	64.00	69.30	41.28	12.85	57.85	2.25
	190. kg/ha	9.22	64.00	72.45	41.20	13.55	60.55	2.31
	210 kg/ha	9.56	64.30	74.20	41.80	14.10	62.70	2.40
	230 kg/ha	9.33	65.35	76.90	43.05	14.85	64.90	2.45
$LSD_{(0.05)}$		--	--	--	--	--	--	--
Level of significance		NS	NS	NS	NS	NS	NS	NS
CV (%)		5.81	4.28	4.35	4.91	5.10	4.60	8.57

4.4 Days required for emergence of spike

Statistically significant differences were recorded in respect of days required for emergence of spike with the effect of different corm size of gladiolus under the experiment (Appendix IV). The maximum (71.28) days required for emergence of spike was recorded in small size corm; whereas the minimum (64.94) days required for emergence of spike was recorded for large size corm which was closely followed by medium size corm (66.93). Large sized corm initially helps the plant for growth and development with supplying storage nutrients in the corm which is the ultimate results of minimum days for emergence of spike (Table 4).

Different levels of potassium fertilizer showed statistically significant variation for days required for emergence of gladiolus spike (Appendix IV). The maximum (70.32) days required for emergence of gladiolus spike was recorded with no potassium fertilizer (Table 4) which was closely followed by 150 and 170 kg/ha (68.33 and 68.00, respectively). The minimum (66.12) days required for emergence of spike was recorded with 230 kg/ha potassium fertilizer which was statistically similar with potassium fertilizer at 210 kg/ha (66.53).

Interaction effect between corm size and potassium fertilizer showed no significant differences for days required for emergence of spike (Appendix IV). But maximum (74.67) days required for emergence of spike was recorded in small size corm with no potassium fertilizer and the minimum (64.00) in large size corm with potassium fertilizer at 190 kg/ha (Table 5).

4.5 Length of flower stalk at harvest

Length of flower stalk at harvest showed a statistically significant difference with the effect of different corm size under the present experiment (Appendix IV). The highest (70.57 cm) length of flower stalk at harvest was recorded in large size corm (Table 4) and the lowest (62.96 cm) was recorded for small size corm which was closely followed by medium size corm (65.64 cm). This might be due to the higher amount of stored food material from large corm. Similar results were also reported by Bhattacharjee (1981) and Dod *et al.* (1989).

Different levels of potassium fertilizer showed statistically significant differences in length of flower stalk at harvest (Appendix IV). The highest (71.20 cm) length of flower stalk at harvest was recorded with potassium fertilizer at 230 kg/ha (Table 4) which was statistically similar by 210 kg/ha (68.87 cm). The lowest (61.18 cm) length of flower stalk was recorded with no potassium fertilizer which was closely followed by potassium fertilizer at 150 kg/ha (63.98 cm).

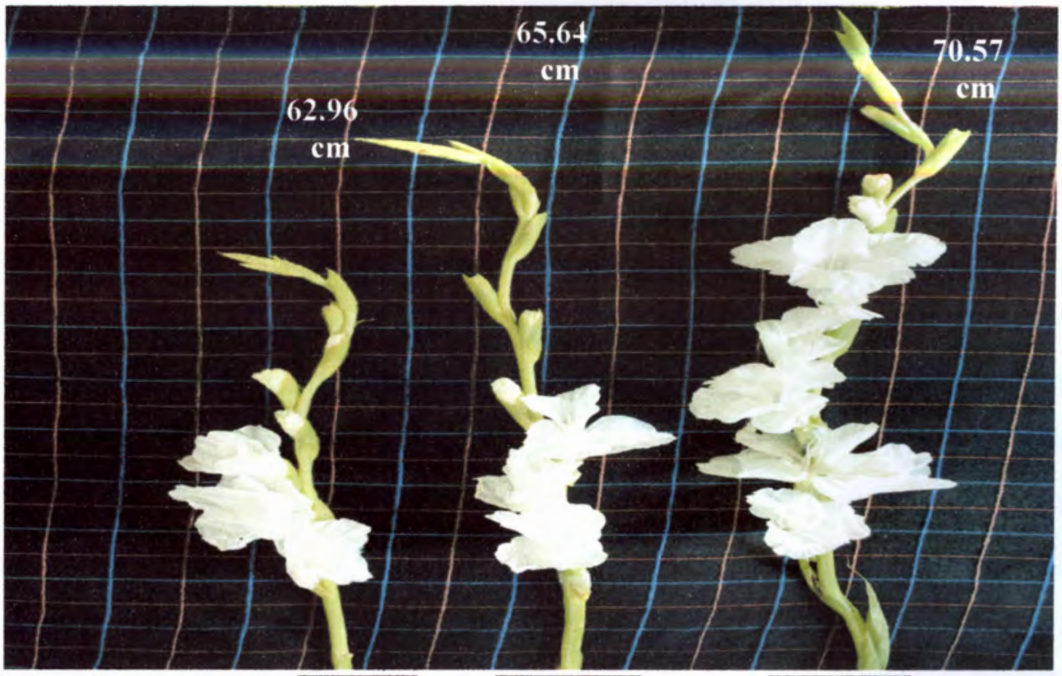
There were no interactions effects between corm size and potassium fertilizer on number of flower stalk at harvest (Appendix IV). But highest (76.90 cm) length of flower stalk at harvest was recorded in large size corm with potassium fertilizer of 230 kg/ha and the lowest (58.85 cm) length of flower stalk was recorded in small size corm with no potassium fertilizer (Table 5).

4.6 Length of rachis at harvest

Length of rachis at harvest showed a statistically significant difference with the effect of different corm size under the present trial (Appendix IV). The highest (41.12 cm) length of rachis at harvest was recorded in large size corm (Table 4) which was closely followed by medium size corm (39.45 cm). On the other hand lowest (35.12 cm) length of rachis was recorded for small size corm (Plate 1). The increased rachis length from large corm was probably due to the presence of higher food materials in the large corm which resulted in better vegetative and reproductive growth of the plant.

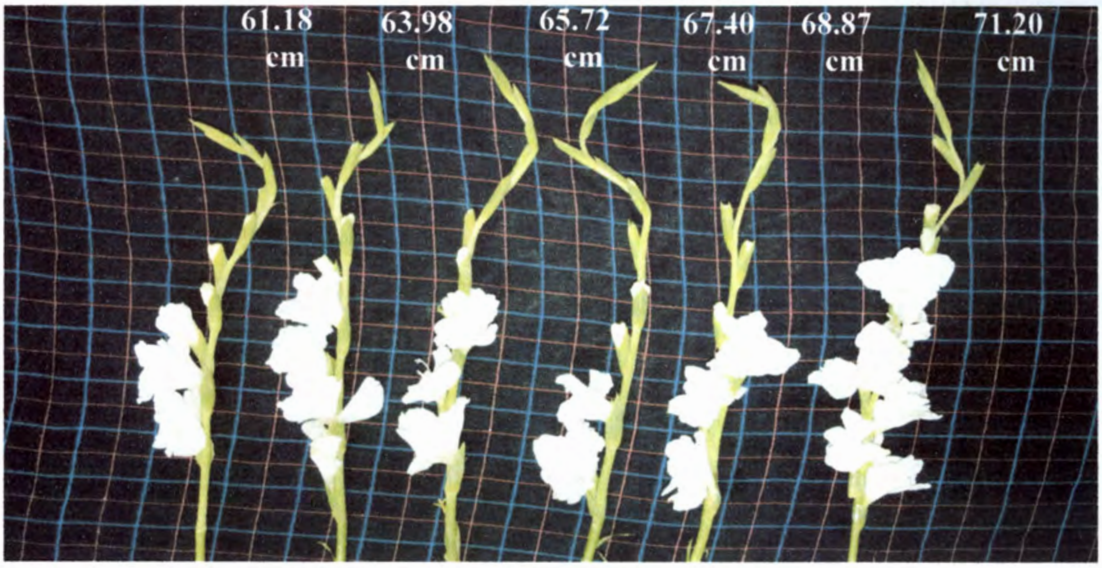
Statistically significant differences were recorded in length of rachis at harvest for different level of potassium fertilizer (Appendix IV). The highest (41.22 cm) length of rachis at harvest was recorded with potassium fertilizer at 230 kg/ha (Table 4) which was statistically similar by 210 kg/ha (39.48 cm). The lowest (36.82 cm) length of rachis was recorded with no potassium fertilizer which was statistically similar with potassium fertilizer at 150 kg/ha (36.87 cm), showed in plate 2.

Corm size and different levels of potassium fertilizer showed no significant interaction effect on length of rachis at harvest (Appendix IV). But highest (43.05 cm) length of rachis at harvest was recorded in large size corm with potassium fertilizer at 230 kg/ha and the lowest (33.00 cm) length of rachis was recorded in small size corm with no potassium fertilizer (Table 5).



Small Medium Large

Plate : 1 Effect of corm size on the length of flower stalk.



Control | 150 kg/ha | 170 kg/ha | 190 kg/ha | 210 kg/ha | 230 kg/ha

Plate: 2 Effect of different levels of potassium fertilizer on the length of flower stalk.

4.7 Number of spikelet/spike

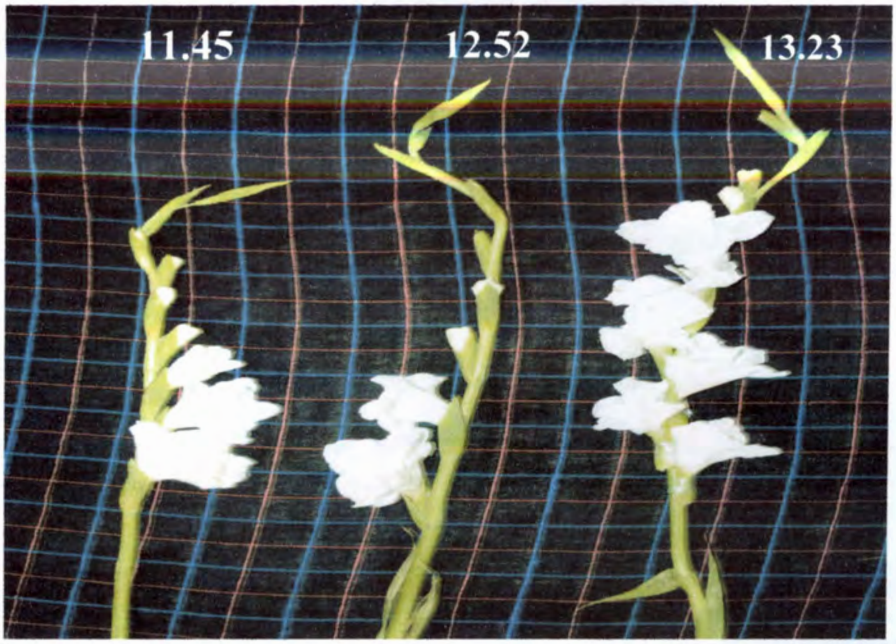
Statistically significant differences were recorded in number of spikelet per spike with different corm size under the trial (Appendix IV). The highest (13.23) number of spikelet/spike was recorded in large size corm (Table 4). The lowest (11.45) number of spikelet/spike was recorded for small size corm.

Different levels of potassium fertilizer showed statistically significant variation on number of spikelet/spike (Appendix IV). The highest (13.90) number of spikelet/spike was recorded with potassium fertilizer at 230 kg/ha (Table 4) which was closely followed by 210 kg/ha (13.22). The lowest (11.00) number of spikelet/spike was recorded with no potassium fertilizer which was statistically similar with potassium fertilizer at 150 kg/ha (11.42%) under the present experiment.

There were no interaction effects between corm size and potassium fertilizer for number of spikelet/spike (Appendix IV). Highest (14.85) number of spikelet/spike was recorded in large size corm with 230 kg/ha potassium fertilizer and the lowest (10.00) number of spikelet/spike was recorded in small size corm with no potassium fertilizer (Table 5).

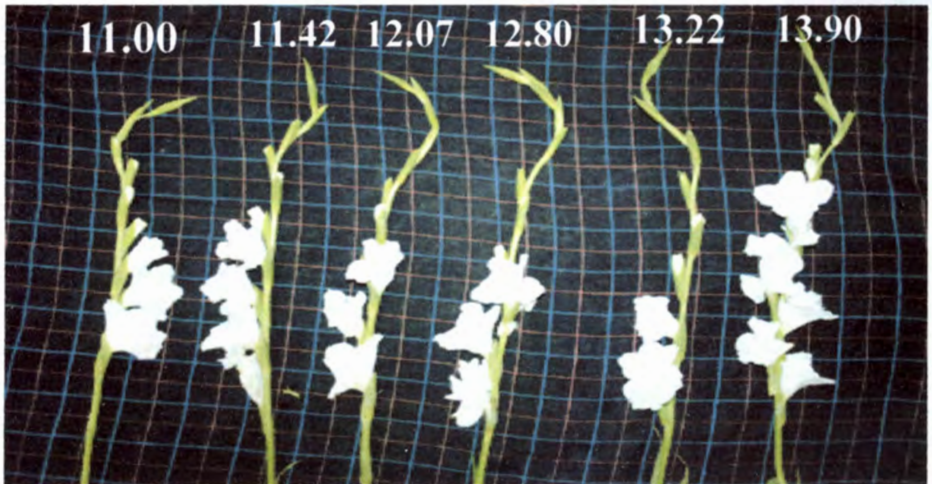
4.8 Weight of single spike

Statistically significant variation was recorded in respect of weight of single spike with the effect of different corm size (Appendix IV). The highest (59.28 g) weight of single spike was recorded in large size corm (Table 4). The lowest (52.83 g) weight of single spike was recorded for small size corm (Plate 3). Large sized corm produced healthy spike which is the ultimate results of maximum weight of single spike. The present results are in agreement with the findings of Bhattacharjee (1981).



Small	Medium	Large

Plate : 3. Effect of corm size on the number of spikelet/spike



Control	150 kg /ha	170 kg /ha	190 kg /ha	210 kg /ha	230 kg /ha

Plate : 4. Effect of different levels of potassium fertilizer on the number of spikelet/spike

Different levels of potassium fertilizer showed statistically significant variation for weight of single spike (Appendix IV). The highest (59.62 g) weight of single spike was recorded with potassium fertilizer at 230 kg/ha (Table 4) which was statistically similar by 210 kg/ha (58.37 g). The lowest (52.47 g) weight of single spike was recorded with no potassium fertilizer which was statistically similar with potassium fertilizer at 150 kg/ha (53.82 g) and showed in plate 4.

There were no interaction effects between corm size and potassium fertilizer for weight of single spike (Appendix IV). But highest (64.90 g) weight of single spike was recorded in large size corm with potassium fertilizer at 230 kg/ha and the lowest (50.55 g) weight was recorded in small size corm with no potassium fertilizer under the present experiment (Table 5).

4.9 Diameter of individual corm

Diameter of individual corm showed a statistically significant difference with the effect of different corm size under the present trial (Appendix IV). The highest (2.27 cm) diameter of individual corm was recorded in large size corm (Table 4) which was statistically similar with medium size corm (2.16 cm). On the other hand the lowest (2.03 cm) diameter of individual corm was recorded for small size corm (Plate 5).

Different levels of potassium fertilizer showed statistically significant variation in diameter of individual corm (Appendix IV). The highest (2.27 cm) diameter of individual corm was recorded with potassium fertilizer at 230 kg/ha (Table 4) which was statistically similar by 210 kg/ha (2.23 cm). The lowest (2.00 cm) diameter of individual corm was recorded with no potassium fertilizer which was followed by potassium fertilizer at 150 kg/ha (2.09 cm), showed in plate 6.

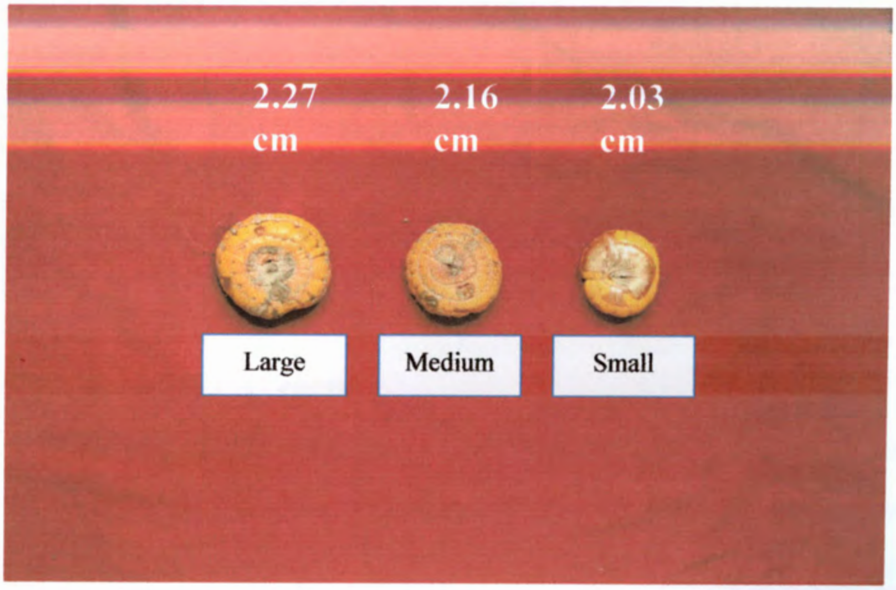


Plate : 5. Effect of corm size on the diameter of individual corm

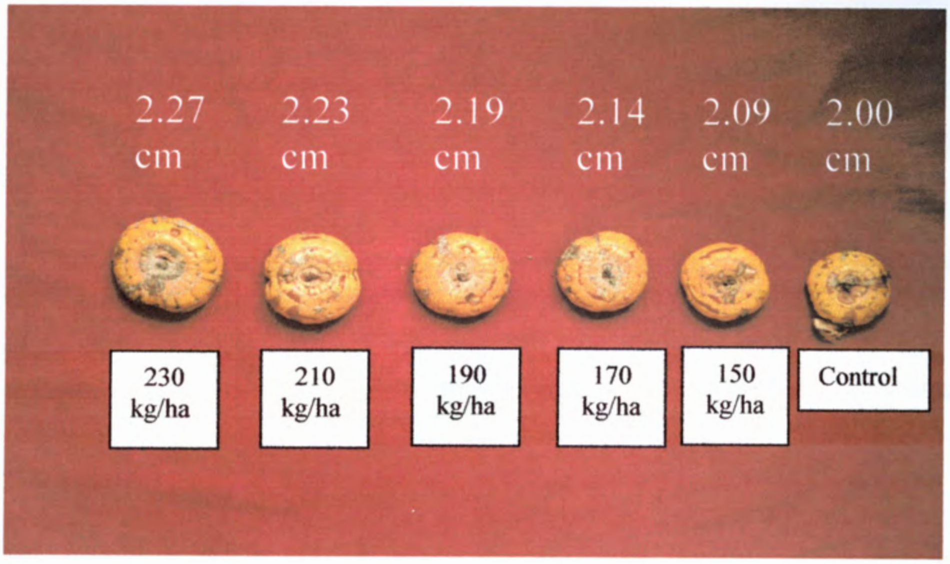


Plate : 6. Effect of different levels of potassium fertilizer on the diameter of individual corm

No interaction effect was recorded between corm size and potassium fertilizer on diameter of individual corm (Appendix IV). But highest (2.45 cm) diameter of individual corm was recorded in large size corm with potassium fertilizer at 230 kg/ha and the lowest (1.95 cm) diameter of individual corm was recorded in small size corm with no potassium fertilizer which was closely followed by small size corm with 150 kg/ha potassium fertilizer (Table 5).

4.10 Length of individual corm

A statistically significant variation was recorded in respect of height of individual corm with the effect of different corm size under the experiment (Appendix V). The maximum (5.17 cm) height of individual corm was recorded in large size corm (Table 6). The minimum (4.38) height of individual corm was recorded for small size corm.

Different levels of potassium fertilizer showed statistically significant variation in relation with height of individual corm (Appendix V). The maximum (5.15 cm) height of individual corm was recorded with potassium fertilizer at 230 kg/ha (Table 6) which was statistically similar by 210 kg/ha (4.99 cm). The minimum (4.33 cm) height of individual corm was recorded in the plot with no potassium fertilizer which was statistically identical with potassium fertilizer at 150 kg/ha (4.57 cm).

No interaction effects between corm size and potassium fertilizer for height of individual corm was recorded under the present trail (Appendix V). But maximum (5.75 cm) height of individual corm was recorded in large size corm with potassium fertilizer at 230 kg/ha and the minimum (4.15 cm) height of individual corm was recorded in small size corm with no potassium fertilizer (Table 7).

4.11 Weight of single corm

Corm size under the trail showed a statistically significant variation in respect of weight of single corm (Appendix V). The highest (43.49 g) weight of single corm was recorded in large size corm (Table 6). The lowest (27.65 g) weight of single corm was recorded for small size corm.

Statistically significant variation was recorded for different levels of potassium fertilizer in weight of single corm (Appendix V). The highest (40.25 g) weight of single corm was recorded with potassium fertilizer at 230 kg/ha (Table 6) which was closely followed by 210 kg/ha (37.75 g). The lowest (30.69 g) weight of single corm was recorded with no potassium fertilizer which was closely followed by potassium fertilizer at 150 kg/ha (33.29 g).

There were no interaction effects between corm size and potassium fertilizer for weight of single corm (Appendix V). Highest (47.55 g) weight of single corm was recorded in large size corm with potassium fertilizer at 230 kg/ha and the lowest (23.07 g) weight of single corm was recorded in small size corm with no potassium fertilizer (Table 7).

Table 6. Main effect of corm size and potassium fertilizer on length of individual corm, weight of single corm, number cormel/plant and percentage of flowering plant, number of spike and yield of spike, corm and cormel of gladiolus

Corm size	Length of individual corm (cm)	Weight of single corm (g)	Number of cormel/plant	Percentage of flowering plant	Number of spike/ha ('000)	Yield (t/ha)		
						Spike	Corm	Cormel
Corm size								
Small	4.38	27.65	21.97	87.17	560.47	23.48	11.53	9.59
Medium	4.72	35.95	23.93	88.67	607.62	25.45	12.29	10.95
Large	5.17	43.49	26.18	92.17	663.96	27.82	14.37	12.27
$LSD_{(0.05)}$	0.201	1.325	1.194	0.021	49.14	1.980	1.672	0.683
Level of significance	**	**	**	**	**	**	**	**
Potassium fertilizer								
Control	4.33	30.69	21.48	86.33	540.93	22.67	10.90	9.71
150 kg/ha	4.57	33.29	22.52	87.66	575.94	24.12	11.61	10.22
170 kg/ha	4.67	35.19	23.67	89.00	595.92	24.96	12.24	10.65
190. kg/ha	4.83	36.98	24.62	90.00	622.66	26.08	13.15	11.12
210 kg/ha	4.99	37.75	25.45	91.00	646.06	27.06	13.73	11.68
230 kg/ha	5.15	40.25	26.43	92.00	682.59	28.60	14.74	12.23
$LSD_{(0.05)}$	0.284	1.120	1.688	0.302	69.50	2.800	2.364	0.966
Level of significance	**	**	**	**	**	**	**	**

** Significant at 1% level of probability

Table 7. Interaction effect of corm size and potassium fertilizer on length of individual corm, weight of single corm, number cormel/plant and percentage of flowering plant, number of spike and yield of spike, corm and cormel of gladiolus

Corm size × Potassium fertilizer		Length of individual corm (cm)	Weight of single corm (g)	Number cormel/plant	Percentage flowering plant	Number of spike/ha ('000)	Yield (t/ha)		
							Spike	Corm	Cormel
Small	Control	4.15	23.07	19.55	84.00	489.19	20.49	10.00	8.48
	150 kg/ha	4.25	25.78	20.80	86.00	548.65	22.98	10.15	8.95
	170 kg/ha	4.30	26.90	21.75	87.00	550.79	23.07	10.79	9.20
	190. kg/ha	4.45	28.50	22.80	88.00	572.52	23.98	11.90	9.85
	210 kg/ha	4.50	30.02	23.15	89.00	582.79	24.41	12.35	10.15
	230 kg/ha	4.65	31.60	23.80	89.00	618.84	25.92	13.97	10.90
Medium	Control	4.35	29.50	21.05	86.00	543.87	22.78	10.66	9.85
	150 kg/ha	4.60	33.20	22.60	87.00	571.09	23.92	11.09	10.15
	170 kg/ha	4.68	35.90	23.85	89.00	592.58	24.82	11.95	10.80
	190. kg/ha	4.75	37.40	24.70	89.00	607.62	25.45	12.67	11.05
	210 kg/ha	4.90	38.09	25.25	90.00	639.85	26.80	13.20	11.80
	230 kg/ha	5.05	41.60	26.10	91.00	690.70	28.95	14.19	12.05
Large	Control	4.50	39.50	23.85	89.00	589.71	24.75	12.05	10.80
	150 kg/ha	4.85	40.90	24.15	90.00	608.09	25.45	13.60	11.55
	170 kg/ha	5.03	42.78	25.40	91.00	644.39	26.99	13.98	11.95
	190. kg/ha	5.30	45.05	26.35	93.00	687.84	28.81	14.89	12.45
	210 kg/ha	5.58	45.13	27.95	94.00	715.53	29.97	15.65	13.10
	230 kg/ha	5.75	47.55	29.40	96.00	738.22	30.92	16.05	13.75
$LSD_{(0.05)}$		--	--	--	--	--	--	--	--
Level of significance		NS	NS	NS	NS	NS	NS	NS	NS
CV (%)		6.22	4.99	7.34	3.51	4.19	8.54	6.09	9.22

NS : Non Significant

4.12 Number of cormel/plant

Statistically significant variation was recorded in respect of number of cormel/plant with the effect of different corm size under the trial (Appendix V). The highest (26.18) number of cormel/plant was recorded in large size corm (Table 6). The lowest (21.97) number of cormel/plant was recorded for small size corm which was closely followed by medium size corm (23.93). Generally large sized corm ensured the proper growth and development of gladiolus and the ultimate results is the highest number of cormel/plant. The result is in agreement with the findings of Mollah *et al*. (1995).

Different levels of potassium fertilizer showed significant variation for number of cormel/plant (Appendix V). The highest (26.43) number of cormel/plant was recorded with potassium fertilizer at 230 kg/ha (Table 6) which was statistically similar by 210 kg/ha (25.45). The lowest (21.48) number of cormel/plant was recorded with no potassium fertilizer which was closely followed by potassium fertilizer at 150 kg/ha (22.52).

No interaction effects were recorded between corm size and potassium fertilizer for number of cormel/plant (Appendix V). But highest (29.40) number of cormel/plant was recorded in large size corm with potassium fertilizer at 230 kg/ha and the lowest (19.55) number of cormel/plant was recorded in small size corm with no potassium fertilizer (Table 7).

4.13 Percentage of flowering plant

A statistically significant variation was observed in respect of percentage of flowering plant of gladiolus with the effect of different corm size under the trial (Appendix V). The highest (92.17%) percentage of flowering plant was recorded in large size corm (Table 6). The lowest (87.17%) percentage of flowering plant was recorded for small size corm which was closely followed by medium size corm (88.67%). This might be due to higher food reserve in large corm. Similar results have also been reported by Mollah *et al*. (1995).

Percentage of flowering plant for different levels of potassium fertilizer also showed statistically significant variation (Appendix V). The highest (92.00%) percentage of flowering plant was recorded with potassium fertilizer at 230 kg/ha (Table 6) which was statistically similar by 210 kg/ha (91.00%). The lowest (86.00%) percentage of flowering plant was recorded with no potassium fertilizer which was statistically identical with potassium fertilizer at 150 kg/ha (87.67%).

Interaction effects of corm size and potassium fertilizer were found non-significant for percentage of flowering plant (Appendix V). But highest (96.00%) percentage of flowering plant was recorded in large size corm with potassium fertilizer at 230 kg/ha and the lowest (84.00%) percentage flowering plant was recorded in small size corm with no potassium fertilizer (Table 7).

4.14 Number of spike/ha

Statistically significant variations were recorded in respect of thousand number of spike with the effect of different corm size under the trial (Appendix V). The highest (663.96) thousand number of spike was recorded in large size corm (Table 6). The lowest (560.47) thousand number of spike was recorded for small size corm.

Different levels of potassium fertilizer showed statistically significant variation for thousand number of spike (Appendix V). The highest (682.59) thousand number of spike was recorded in the plot with potassium fertilizer at 230 kg/ha (Table 6) which was closely followed by at 210 kg/ha (646.06). The lowest (540.93) thousand number of spike was recorded in the plot with no potassium fertilizer. Singh *et al.* (1976) reported that the highest level of potassium increased the number of spike.

Interaction effects of corm size and potassium fertilizer were found non-significant for thousand number of spike (Appendix V). But highest (738.22) thousand number of spike was recorded in large size corm with potassium fertilizer at 230 kg/ha and the lowest (489.19) thousand number of spike was recorded in small size corm with no potassium fertilizer (Table 7).

4.15 Yield of spike (t/ha)

Corm size showed a statistically significant variation in respect of yield of spike (Appendix V). The highest (27.82 t/ha) yield of spike was recorded in large size corm (Table 6) and the lowest (23.48 t/ha) was recorded for small size corm which was closely followed by medium size corm (25.45 t/ha).

Different levels of potassium fertilizer showed statistically significant variation for yield of spike (Appendix V). The highest yield (28.60 t/ha) of spike was recorded with potassium fertilizer at 230 kg/ha (Table 6) which was statistically similar by 210 kg/ha (27.06 t/ha). The lowest yield (22.67 t/ha) of spike was recorded with no potassium fertilizer which was statistically identical with potassium fertilizer at 150 kg/ha (24.12 t/ha).

Interaction effects of corm size and potassium fertilizer were found non-significant for yield of spike (Appendix V). But highest yield (30.92 t/ha) of spike was recorded in large size corm with 230 kg/ha potassium fertilizer and the lowest (20.49 t/ha) was recorded in small size corm with no potassium fertilizer (Table 7).

4.16 Yield of corm (t/ha)

Statistically significant variations were recorded in respect of yield of corm with the effect of different corm size under the trial (Appendix V). The highest yield (14.37 t/ha) of corm was recorded in large size corm (Table 6). The lowest yield (11.53 t/ha) of corm was recorded for small size corm which was statistically identical with medium size corm (12.29 t/ha).

Different levels of potassium fertilizer showed statistically significant variation for yield of corm (Appendix V). The highest yield (14.74 t/ha) of corm was recorded with potassium fertilizer at 230 kg/ha (Table 6) which was closely followed by 210 kg/ha (13.73 t/ha). The lowest yield (10.90 t/ha) of corm was recorded with no potassium fertilizer which was statistically identical with potassium fertilizer at 150 kg/ha (11.61 t/ha).

Interaction effects of corm size and potassium fertilizer were found non-significant for yield of corm (Appendix V). But highest yield (16.05 t/ha) of corm was recorded in large size corm with potassium fertilizer at 230 kg/ha and the lowest yield (10.00 t/ha) of corm was recorded in small size corm with no potassium fertilizer (Table 7).

4.17Yield of cormel (t/ha)

Statistically significant variations were recorded in respect of yield of cormel with the effect of different corm size under the trial (Appendix V). The highest yield (12.27t/ha) of cormel was recorded in large size corm (Table 6). The lowest yield (9.59t/ha)of cormel was recorded for small size corm.

Different levels of potassium fertilizer showed statistically significant variation for yield of cormel (Appendix V). The highest yield (12.23 t/ha)of cormel was recorded with potassium fertilizer at 230 kg/ha (Table 6) which was statistically similar by 210 kg/ha (11.68 t/ha). The lowest yield (9.71 t/ha)of cormel was recorded in the plot with no potassium fertilizer which was statistically identical with potassium fertilizer at 150 kg/ha (10.22 t/ha).

Interaction effects of corm size and potassium fertilizer were found non-significant for yield of cormel (Appendix V). But highest yield (13.75 t/ha) of cormel was recorded in large size corm with potassium fertilizer at 230 kg/ha and the lowest yield (8.48 t/ha) of cormel was recorded in small size corm with no potassium fertilizer (Table 7).

4.18 Benefit Cost Ratio

The economic analysis was done to find out the gross and net return and the benefit cost ratio in the present experiment and presented under the following headings-

4.18.1 Gross return

In the combination of corm size and different level of potassium fertilizer highest gross return (Tk. 11,16,470) was obtained from the treatment combination of large size corm and potassium fertilizer with 230 kg/ha and the second highest gross return (Tk. 10,81,280) was obtained in large size corm and potassium fertilizer at 210 kg/ha. The lowest gross return (Tk. 4,23,980) was obtained in the small size corm with no potassium fertilizer (Table 8).

4.18.2 Net return

In case of net return different treatment combination showed different types of net return. In the combination of different corm size and different levels of potassium fertilizer, highest net return (Tk. 8,30,396) was obtained from the treatment combination of large size corm and potassium fertilizer with 230 kg/ha and the second highest net return (Tk. 7,95,495) was obtained in large size corm and 210 kg/ha potassium fertilizer. The lowest net return (Tk. 4,41237) was obtained in the small size corm and no potassium fertilizer (Table 8).

4.18.3 Benefit cost ratio

In the combination of different corm size and levels of potassium fertilizer highest benefit cost ratio (3.90) was attained from the treatment combination of large size corm and potassium fertilizer at 230 kg/ha and the second highest benefit cost ratio (3.90) was estimated in large size corm and potassium fertilizer at 230 kg/ha. The lowest benefit cost ratio (2.56) was obtained in small size corm and no potassium fertilizer (Table 8).

Table : 8 Cost and return of gladiolus cultivation as influenced by corm size and potassium fertilizer

Corm size × potassium fertilizer		cost of production (Tk./ha)	Yield of corm (t/ha)	Price of corm (Tk.)	yield of cormel (t/ha)	Price of cormel	Price of cut flower	Gross return (Tk./ha)	Net return (Tk. ha)	Benefit cost ratio
Small	**Control**	282753	10.00	150000	8.48	84800	489190	723990	441237	**2.56**
	150 kg /ha	284919	10.15	152250	8.95	89500	548650	790400	505481	2.77
	170 kg /ha	285207	10.79	161850	9.20	92000	550790	804640	519433	2.82
	190 kg /ha	285496	11.90	178500	9.85	98500	572520	849520	564024	2.98
	210 kg /ha	285785	12.35	185250	10.15	101500	582790	869540	583755	3.04
	230 kg /ha	286074	13.97	209550	10.90	109000	618840	937390	651316	3.28
Medium	Control	282752	10.66	159900	9.85	98500	543870	802270	519518	2.84
	150 kg /ha	284919	11.09	166350	10.15	101500	571090	838940	554021	2.94
	170 kg /ha	285207	11.95	179250	10.80	108000	592580	879830	594623	3.08
	190 kg /ha	285496	12.67	190050	11.05	110500	607620	908170	622674	3.18
	210 kg /ha	285785	13.20	198000	11.80	118000	639850	955850	670065	3.34
	230 kg /ha	286074	14.19	212850	12.05	120500	690700	1024050	737976	3.58
Large	Control	282752	12.05	180750	10.80	108000	589710	878460	595708	3.11
	150 kg /ha	284919	13.60	204000	11.55	115500	608090	927590	642671	3.26
	170 kg /ha	285207	13.98	209700	11.95	119500	644390	973590	688383	3.41
	190 kg /ha	285496	14.89	223350	12.45	124500	687840	1035690	750194	3.63
	210 kg /ha	285785	15.65	234750	13.10	131000	715530	1081280	795495	3.78
	230 kg /ha	286074	16.05	240750	13.75	137500	738220	1116470	830396	**3.90**

Market price of corm @ Tk. 15000/t, cormel Tk. 10000 /t and cut flower Tk. 1/spike.

Chapter V
Summary and Conclusion

CHAPTER V

SUMMARY AND CONCLUSION

A field experiment was conducted in the Horticulture Farm of Sher-e- Bangla Agricultural University, Dhaka, Bangladesh during the period from November, 2005 to June, 2006 to study the effect of different corm size and levels of potassium fertilizer on the growth, flowering, corm and cormel production of gladiolus. The experiment considered of two factors. Factor A: corm size (3 levels) i.e. small (11-20g), medium (21-30g) and large (31-40g); Factor B: Different levels of potassium fertilizer: No potassium (control), 150 kg/ha, 170 kg/ha, 190 kg/ha, 210 kg/ha and 230 kg/ha. There were on the whole 18 (3×6) treatments combinations. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. After emergence of seedlings, various intercultural operations were accomplished for better growth and development of the gladiolus. Data were collected in respect of the gladiolus growth characters and yield of corm, cormel and spike of gladiolus. The data obtained for different characters were statistically analyzed to find out the significance of the difference for corm size and levels of potassium fertilizer.

Statistically significant variation was recorded in terms of different corm size for all the characters. For days required for emergence of plant the minimum days (9.43) was recorded in large size corm whereas the maximum days (12.17) was recorded for small size corm. In respect of days required for emergence of spike maximum days (71.28) was recorded in small size corm and a minimum days (64.94) was recorded for large size corm. The tallest gladiolus plant at 75 DAP (89.75 cm) was recorded in large size corm and the shortest at 75 DAP (76.83 cm) was recorded for small size corm. On the other hand, the maximum number of leaves/plant at 75 DAS (10.42) was recorded in large size corm and the minimum at 75 DAS (9.58) was recorded for small size corm. The highest number of spikelet/spike (13.23) was recorded in large size corm and the lowest (11.45) was recorded for small size corm. The highest diameter of individual corm (2.27 cm) was recorded in large size corm and the lowest (2.03 cm) was recorded for small size corm. The highest weight of single corm (43.49 g) was recorded in large size corm and the lowest (27.65 g) was recorded for small size corm. The highest number of cormel/plant (26.18) was recorded in large size corm and the lowest (21.97) was recorded for small size corm. The highest percentage of flowering plant (92.17%) was recorded in large size corm and the lowest (87.17%) was recorded for small size corm. The highest thousand number of spike (663.96) was recorded in large size corm and the lowest thousand number of spike (560.47) was recorded for small size corm. The highest yield of corm and cormel (14.37, 12.27 t/ha) was recorded in large size corm and the lowest (11.53, 9.59 t/ha) was recorded for small size corm.

Different levels of potassium fertilizer applied under the present experiment showed statistically significant effect except days required for emergence of plant. The minimum days required for emergence of gladiolus plant (10.77) was recorded with 210 kg/ha and the maximum (11.37) was recorded in the plot with potassium fertilizer 150 kg/ha. The maximum days required for emergence of gladiolus spike (70.32) was recorded with no potassium fertilizer and the minimum days (66.12) was recorded with potassium fertilizer at 230 kg/ha. The highest gladiolus plant at 75 DAS (90.45 cm) was recorded with 230 kg/ha and the shortest plant (75.73 cm) was recorded with no potassium fertilizer. The maximum number of leaves/plant at 75 DAS (10.48) was recorded in potassium fertilizer at 230 kg/ha and the minimum (9.41) was recorded with no potassium fertilizer. The highest number of spikelet/spike (13.90) was recorded with 230 kg/ha and the lowest (11.00) was recorded with no potassium fertilizer. The highest diameter of individual corm (2.27 cm) was recorded in the plot with potassium fertilizer at 230 kg/ha and the lowest (2.00 cm) was recorded in the plot with no potassium fertilizer. The highest weight of single corm (40.25 g) was recorded with 230 kg/ha and the lowest weight (30.69 g) was recorded with no potassium fertilizer. The highest percentage of flowering plant (92.00%) was recorded with potassium fertilizer at 230 kg/ha and the lowest (86.33%) was recorded with no potassium fertilizer. The highest yield of corm and cormel (14.74 and 12.23 t/ha) was recorded with potassium fertilizer at 230 kg/ha and the lowest (10.90 and 9.71 t/ha) was recorded with no potassium fertilizer.

There were no interaction effects between corm size and levels of potassium fertilizer in terms of all the recorded character under the present investigation. Highest gross return (Tk. 11,16,470) was obtained from the treatment combination of large size corm and potassium fertilizer at 230 kg/ha and the lowest gross return (Tk. 7,23,990) was obtained in the small size corm with no potassium fertilizer. The highest net return (Tk. 8,30,396) was obtained from the treatment combination of large size corm and potassium fertilizer at 230 ka/ha and the lowest (Tk. 4,41,237) was obtained in the small size corm and no potassium fertilizer. The highest benefit cost ratio (3.90) was attained from the treatment combination of large size corm and potassium fertilizer at 230 kg/ha and lowest (2.56) was obtained in small size corm and no potassium fertilizer.

Conclusion :

Large size corm (31- 40g) produced tallest plant, highest number of flowering plant and highest yield of spike, corm and cormel. Similarly highest doses of potassium fertilizer at 230 ka/ha produced tallest plant, highest number of flowering plant and highest yield of spike, corm and cormel. The highest benefit cost ratio (3.90) was attained from the treatment combination of large size corm and potassium fertilizer at 230 kg/ha.

Recommendation :

Considering the situation of the present experiment, further studies in the following areas may be suggested:

1. Such study is needed in different agro-ecological zones (AEZ) of Bangladesh for regional compliance and other performance.
2. Another experiment may be carried out with very small size corm for maximizing highest benefit.
3. Potassium fertilizer had significant influence on the growth and yield of gladiolus. So, further study in needed to optimize the level.

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Appendices

APPENDIX

Appendix I : Monthly recorded of air temperature, rainfall, relative humidity and sunshine hours during the period from November 2005 to June 2006.

Year	Month	Average air temperature(^{O}C)			Total rainfall (mm)	Average relative humidity (%)	Total sunshine hours
		Maximum	Minimum	Mean			
2005	November	29.00	19.80	24.40	3	72	198.0
	December	27.00	15.60	21.30	0	66	217.0
2006	January	24.41	13.41	18.91	0	65.47	165.1
	February	30.68	18.77	24.73	0	65.95	171.01
	March	32.95	22.43	27.69	0	52.15	225.83
	April	33.74	23.87	28.81	185	69.41	234.6
	May	33.20	24.20	28.70	291	73	241.8
	June	33.40	26.80	30.10	259	79	96.0

Source : Dhaka Meteorology Center

Appendix II : Soil Characteristics of Horticulture Farm of SAU analyzed by Soil Resources Development Institute (SRDI), Khamar Bari, Farmgate, Dhaka.

A. Morphological characteristics of the experimental field

Morphological features	Characteristics
Location	Horticulture Farm, SAU, Dhaka
AEZ	Madhupur Tract (28)
General Soil Type	Shallow red brown terrace soil
Land type	High
Soil series	Tejgaon
Topography	Fairly leveled
Flood level	Above flood level
Drainage	Well drained
Cropping pattern	Gladiolus --Fallow -- Fallow

B. Physical and chemical properties of the initial soil

Characteristics	Value
Partical size analysis	
% Sand	27
% Silt	43
% Clay	30
Textural Class	Silty - Clay
P^H	5.6
Organic carbon (%)	0.45
Organic matter (%)	0.78
Total N (%)	0.03
Available P (ppm)	20.00
Exchangeable K (meq/100 g soil)	0.10
Available S (ppm)	45

Source : SRDI, 2005

Appendix III. **Analysis of variance of the data on plant height and number of leaves/plant at different days after planting (DAP) as influenced by corm size and different level of potassium fertilizer**

Source of variation	Degrees of freedom	Mean square							
		Plant height				Number of leaves/plant at			
		35 DAP	50 DAP	65 DAP	70 DAP	35 DAP	50 DAP	65 DAP	70 DAP
Replication	2	0.123	6.722	4.667	1.190	0.033	0.042	0.070	0.019
Corm size (A)	2	89.99**	325.40**	169.45**	761.33**	1.102**	2.935**	1.367**	3.790**
Potassium fertilizer (B)	5	48.57**	228.28**	268.32**	257.59**	0.619**	1.702**	1.797**	1.385**
A×B	10	0.631	1.742	1.377	1.987	0.0001	0.0001	0.001	0.075
Error	34	3.086	3.310	5.137	10.408	0.029	0.024	0.148	0.082

** Significant at 1% level of probability

Appendix IV. **Analysis of variance of the data on days required for emergence of plant and spike, length of flower stalk, length of rachis at harvest, number of spikelet, weight of spikelet, diameter of individual corm of gladiolus as influenced by corm size and different level of potassium fertilizer**

Source of variation	Degrees of freedom	Mean square						
		Days required for emergence of plant	Days required for emergenc e of spike	Length of flower stalk (cm)	Length of rachis at harvest	Number of spikelet /spike	Weight of single spike (g)	Diameter of corm (cm)
Replication	2	0.088	12.583	0.802	5.018	0.802	1.711	0.049
Corm size (A)	2	35.036**	188.99**	268.7**	172.97**	14.39**	187.1**	0.273**
Potassium fertilizer (B)	5	0.403	21.112*	114.6**	26.018**	11.07**	67.57**	0.088*
A×B	10	0.307	3.649	4.553	1.142	0.085	5.23	0.008
Error	34	0.405	8.419	8.335	3.579	0.400	6.682	0.034

* Significant at 5% level of probability
** Significant at 1% level of probability

Appendix V. Analysis of variance of the data length of individual corm, weight of single corm, number of cormel/plant and percentage of flowering plant, number of spike, yield of spike, corm and cormel of gladiolus as influenced by corm size and different level of potassium fertilizer

Source of variation	Degrees of freedom	Mean square							
		Length of individual corm (cm)	Weight of single corm (g)	Number of cormel/plant	Percentage of flowering plant	Number of spike/ha ('000)	Yield (t/ha)		
							Spike	Corm	Cormel
Replication	2	0.029	0.026	18.276	0.889	5398.39	1.389	12.170	0.002
Corm size (A)	2	2.791**	1130.035**	79.838**	118.500**	48330057.96**	84.981**	38.955**	32.272**
Potassium fertilizer (B)	5	0.791**	103.855**	30.680**	40.000**	23139632.43**	40.527**	18.065**	7.873**
A×B	10	0.071	1.927	0.712	1.300	637167.47	1.129	0.330	0.081
Error	34	0.088	4.206	3.106	9.830	52625.42	4.769	0.602	1.017

** Significant at 1% level of probability

Appendix VI. Production cost of gladiolus per hectare

A. Input cost

Corm size × Potassium fertilizer		Labour cost	Ploughing cost	Corm Cost	Irrigation Cost	Insecticides	Pesticides	Manure and fertilizers				Miscellaneous cost	Sub Total (A)
								Cowdung	Urea	TSP	MP		
Small	0 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	0.00	10000.00	165925.00
	150 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	1800.00	10000.00	167725.00
	170 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	2040.00	10000.00	167965.00
	190 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	2280.00	10000.00	168205.00
	210 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	2520.00	10000.00	168445.00
	230 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	2760.00	10000.00	168685.00
Medium	0 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	0.00	10000.00	165925.00
	150 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	1800.00	10000.00	167725.00
	170 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	2040.00	10000.00	167965.00
	190 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	2280.00	10000.00	168205.00
	210 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	2520.00	10000.00	168445.00
	230 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	2760.00	10000.00	168685.00
Large	0 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	0.00	10000.00	165925.00
	150 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	1800.00	10000.00	167725.00
	170 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	2040.00	10000.00	167965.00
	190 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	2280.00	10000.00	168205.00
	210 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	2520.00	10000.00	168445.00
	230 kg/ha	28000.00	5000.00	63250.00	3000.00	2000.00	1000.00	50000.00	1800.00	1875.00	2760.00	10000.00	168685.00

Corm size	Potassium fertilizer	
Small	0 kg/ha	130 kg/ha
Medium	90 kg/ha	150 kg/ha
Large	110 kg/ha	170 kg/ha

Corm : Small 15 Tk/kg; Medium 20 Tk/kg and Large 22 Tk/kg

Urea @ Tk. 8/kg; TSP @ Tk. 15/kg; MP @ Tk. 12 kg/ha; Labour cost @ Tk. 70/day

Appendix VI. Contd.

Corm size × Potassium fertilizer		Cost of lease of land for 9 months (13% of value of land Tk. 6,00000/year	Miscellaneous cost (Tk. 5% of the input cost	Interest on running capital for 12 months (Tk. 13% of cost/year	Sub total (Tk) (B)	Total cost of production (Tk./ha) [Input cost (A)+ overhead cost (B)]
Small	0 kg/ha	78000	21570	17257	134085	282753
	90 kg/ha	78000	21804	17389	117194	284919
	110 kg/ha	78000	21835	17407	117242	285207
	130 kg/ha	78000	21867	17425	117291	285496
	150 kg/ha	78000	21898	17442	117340	285785
	170 kg/ha	78000	21929	17460	117389	286074
Medium	0 kg/ha	78000	21570	17257	116827	282752
	90 kg/ha	78000	21804	17389	117194	284919
	110 kg/ha	78000	21835	17407	117242	285207
	130 kg/ha	78000	21867	17425	117291	285496
	150 kg/ha	78000	21898	17442	117340	285785
	170 kg/ha	78000	21929	17460	117389	286074
Large	0 kg/ha	78000	21570	17257	116827	282752
	90 kg/ha	78000	21804	17389	117194	284919
	110 kg/ha	78000	21835	17407	117242	285207
	130 kg/ha	78000	21867	17425	117291	285496
	150 kg/ha	78000	21898	17442	117340	285785
	170 kg/ha	78000	21929	17460	117389	286074

Corm size	**Potassium fertilizer**	
Small	0 kg/ha	190 kg/ha
Medium	150 kg/ha	210 kg/ha
Large	170 kg/ha	230 kg/ha